Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A therapeutic radiation source, comprising:

A. a probe assembly including an optical delivery structure having a proximal end and a distal end, said optical delivery structure being adapted for transmitting optical radiation incident on said proximal end to said distal end;

B. an optical source, including means for generating a beam of optical radiation directed to said proximal end of said optical delivery structure;

C. a radiation generator assembly coupled to said probe assembly, including:

a. an electron source, responsive to optical radiation transmitted to said distal end of said optical delivery structure, for emitting electrons, the electron source including a thermionic cathode having an electron emissive surface; and

b. a target element including at least one radiation emissive material adapted to emit therapeutic radiation in response to incident accelerated electrons from said electron source; and

D. means for providing an accelerating voltage between said electron source and said target element so as to establish an accelerating electric field which acts to accelerate electrons emitted from said electron source toward said target element; wherein said optical delivery structure is adapted for directing a beam of optical radiation transmitted therethrough to impinge upon a surface of said thermionic cathode, and wherein said beam of transmitted optical radiation has a power level sufficient to heat at least a portion of said surface to an electron emitting temperature so as to cause thermionic emission of electrons from said surface.

2. (Original) A therapeutic radiation source according to claim 1, wherein said optical source is a laser, and wherein said beam of optical radiation is substantially monochromatic and coherent.

3. (Original) A therapeutic radiation source according to claim 1, wherein said electron emissive surface of said thermionic cathode is formed of a metallic material.

4. (Original) A therapeutic radiation source according to claim 3, wherein said metallic material includes tungsten, thoriated tungsten, tungsten alloys, thoriated rhenium, and tantalum.

5. (Original) A therapeutic radiation source according to claim 1, wherein the emitted electrons form an electron beam along a beam path, and wherein said target assembly is positioned in said beam path.

6. (Amended) A therapeutic radiation source according to claim [1] 5, wherein said electron beam is characterized by a current in the approximate range of about 1 nA to about 1 mA.

7. (Original) A therapeutic radiation source according to claim 6, further including selectively operable control means for selectively controlling the amplitude of said beam current.

8. (Original) A therapeutic radiation source according to claim 1, wherein said electrons incident on said target element from said electron emissive surface are accelerated by said accelerating electric field to energies in the approximate range of 10 keV to 90 keV.

9. (Original) A therapeutic radiation source according to claim 1, wherein the means for providing an accelerating voltage includes: a power supply, having a first terminal and a second terminal, and a drive means for establishing an output voltage between said first terminal and said second terminal, said power supply being electrically coupled to said radiation generator

assembly by way of said first terminal and said second terminal.

10. (Original) A therapeutic radiation source according to claim 9, wherein said first terminal of said power supply is electrically coupled to said electron emissive surface of said thermionic cathode and said second terminal of said power supply is electrically coupled to said target element, thereby establishing an electric field which acts to accelerate electrons emitted from said electron emissive surface of said thermionic cathode toward said target element.

11. (Original) A therapeutic radiation source according to claim 9, wherein said second terminal is at ground potential.

12. (Original) A therapeutic radiation source according to claim 9, wherein said power supply further includes selectively operable control means for selectively controlling the amplitude of said output voltage.

13. (Original) A therapeutic radiation source according to claim 1, wherein said thermionic cathode includes a metallic base coated with an oxide.

14. (Original) A therapeutic radiation source according to claim 13, wherein said oxide includes barium oxide, strontium oxide, and calcium oxide, and said metallic base includes nickel.

15. (Original) A therapeutic radiation source according to claim 1, wherein said optical delivery structure includes a fiber optic cable.

16. (Original) A therapeutic radiation source according to claim 15, wherein said probe assembly includes a flexible, electrically conductive catheter enclosing said fiber optic cable.

17. (Original) A therapeutic radiation source according to claim 16, wherein said electrically conductive catheter is adapted for coupling said second terminal of said power supply to said radiation generator assembly.

18. (Original) A therapeutic radiation source according to claim 16, wherein the means for establishing an accelerating voltage includes a power supply, said power supply having a first terminal and a second terminal, said power supply being electrically coupled to said radiation generator assembly by way of said first terminal and said second terminal.

19. (Original) A therapeutic radiation source according to claim 18, wherein said fiber optic cable includes an electrically conductive outer surface, said electrically conductive outer surface being adapted for electrically coupling said first terminal of said power supply to said thermionic cathode.

20. (Original) A therapeutic radiation source according to claim 19, further comprising a layer of dielectric material between said electrically conductive outer surface of said fiber optical cable and an inner surface of said flexible catheter.

21. (Original) A therapeutic radiation source according to claim 1, further including: a substantially rigid capsule, wherein said electron source and said target element are disposed within said capsule, and further wherein said capsule defines a substantially evacuated interior region extending along a beam axis between said thermionic cathode at a proximal end of said capsule and said target element at a distal end of said capsule.

22. (Original) A therapeutic radiation source according to claim 1 wherein said therapeutic radiation includes x-rays.

23. (Original) A therapeutic radiation source according to claim 1, wherein power required to

heat said electron emissive surface of said cathode so as to generate an electron beam forming a current of about 100 micro amps is between about 0.1 Watts to about 3.0 Watts.

24. (Original) A therapeutic radiation source according to claim 1, wherein said target element is spaced apart and opposite said electron emissive surface of said thermionic cathode.

25. (Original) A source of therapeutic radiation, comprising:

A. a radiation generator assembly, including:

a. an electron source for emitting electrons to generate an electron beam along a beam path, wherein said electron source includes a thermionic cathode having an electron emissive surface; and

b. a target element positioned in said beam path, said target element being spaced apart from and opposite said electron emissive surface, said target element comprising at least one radiation emissive element adapted to emit therapeutic radiation in response to incident accelerated electrons from said electron beam; and

c. a substantially rigid capsule, wherein said electron source and said target element are disposed within said capsule, and further wherein said capsule defines a substantially evacuated interior region extending along a beam axis between said thermionic cathode at a proximal end of said housing and a radiation transmissive window at a distal end of said housing;

B. a source of laser radiation;

C. a probe assembly coupled to said radiation generator assembly and including an optical delivery structure, said optical delivery structure having a proximal end and a distal end; wherein said optical delivery structure is adapted for transmitting laser radiation, generated by said source and incident on said proximal end, to said distal end, and for directing a beam of said transmitted laser radiation to impinge upon said electron emissive surface of said thermionic

cathode, and wherein said beam of laser radiation has a power level sufficient to heat at least a portion of said surface to an electron emitting temperature so as to cause thermionic emission of electrons from said surface;

D. one or more reflector elements disposed at predetermined locations along an inner surface of said capsule, said one or more reflector elements being operative to reflect incident laser radiation unabsorbed by said thermionic cathode back to said thermionic cathode.

26. (Amended) A probe having a radiation source at a distal end, comprising:

A. a probe assembly including an optical delivery structure adapted for transmitting optical radiation;

B. an optical source for generating optical radiation directed to an end of said optical delivery structure;

C. a radiation source coupled to a distal end of said optical delivery structure, said radiation source comprising a thermionic cathode and a target element;

1. a. wherein the thermionic cathode is responsive to said optical radiation transmitted to said distal end to emit electrons; and

2. b. wherein said target element is responsive to incident electrons emitted from said thermionic cathode to emit radiation;

D. means for establishing an accelerating electric field extending between said thermionic cathode toward said target element, the electric field being effective to accelerate electrons emitted from the thermionic cathode along a beam path towards said target element;

wherein said optical delivery structure is adapted to direct a beam of optical radiation transmitted therethrough to impinge upon a surface of the thermionic cathode, and wherein said beam of transmitted optical radiation has a power level sufficient to heat at least a portion of said surface to an electron emitting temperature so as to cause thermionic emission of electrons from said surface.

27. (Previously Presented) A probe in accordance with claim 26, wherein said optical source comprises at least one of a laser and an LED (light emitting diode).

28. (Previously Presented) A probe in accordance with claim 26, wherein said radiation source comprises an x-ray source, and said radiation emitted from said target element comprises x-rays.

29. (Previously Presented) A probe in accordance with claim 26, wherein said optical delivery structure comprises a fiber optic cable.

30. (Previously Presented) A probe in accordance with claim 26, wherein said radiation source comprises a substantially rigid housing enclosing said thermionic cathode and said target elements, wherein said housing defines a substantially evacuated interior region extending along said beam path between a proximal end and a distal end of said housing.

31. (Previously Presented) A radiation source, comprising:

A. a probe assembly including an optical delivery structure, said optical delivery structure being adapted for transmitting optical radiation incident on a proximal end thereof to a distal end thereof;

B. an optical source for generating a beam of optical radiation directed to said proximal end of said optical delivery structure;

C. a radiation generator assembly coupled to said probe assembly, including:

a. an electron source, responsive to optical radiation transmitted to said distal end of said optical delivery structure, for emitting electrons, the electron source including a thermionic cathode having an electron emissive surface; and

b. a target element including at least one radiation emissive material adapted to emit radiation in response to incident accelerated electrons from said electron source; and

D. means for providing an accelerating voltage between said electron source and said target element so as to establish an accelerating electric field which acts to accelerate electrons emitted from said electron source toward said target element;

wherein said optical delivery structure is adapted for directing a beam of optical radiation transmitted therethrough to impinge upon a surface of said thermionic cathode, and wherein said beam of transmitted optical radiation has a power level sufficient to heat at least a portion of said surface to an electron emitting temperature so as to cause thermionic emission of electrons from said surface.

32. (Previously Presented) A flexible probe having an x-ray tube as a distal end, comprising:

A. an optical source for generating optical radiation,

B. a flexible optical fiber having a proximal end and a distal end, and adapted for transmitting optical radiation incident on said proximal end to said distal end;

C. an x-ray tube coupled to a distal end of said optical fiber, comprising a substantially rigid housing enclosing a thermionic cathode and an x-ray target,

3. a. wherein the thermionic cathode is responsive to said optical radiation transmitted to said distal end to emit electrons; and

4. b. wherein said x-ray target is responsive to incident electrons emitted from said thermionic cathode to emit x-rays;

D. means for establishing an electric field to accelerate electrons emitted from the thermionic cathode toward said x-ray target;

wherein said optical fiber is adapted to direct a beam of optical radiation transmitted therethrough to impinge upon a surface of the thermionic cathode, and wherein said beam of transmitted optical radiation has a power level sufficient to heat at least a portion of said surface to an electron emitting temperature so as to cause thermionic emissions of electrons from said surface.